n 3/2

United States
Environmental Protection
Agency

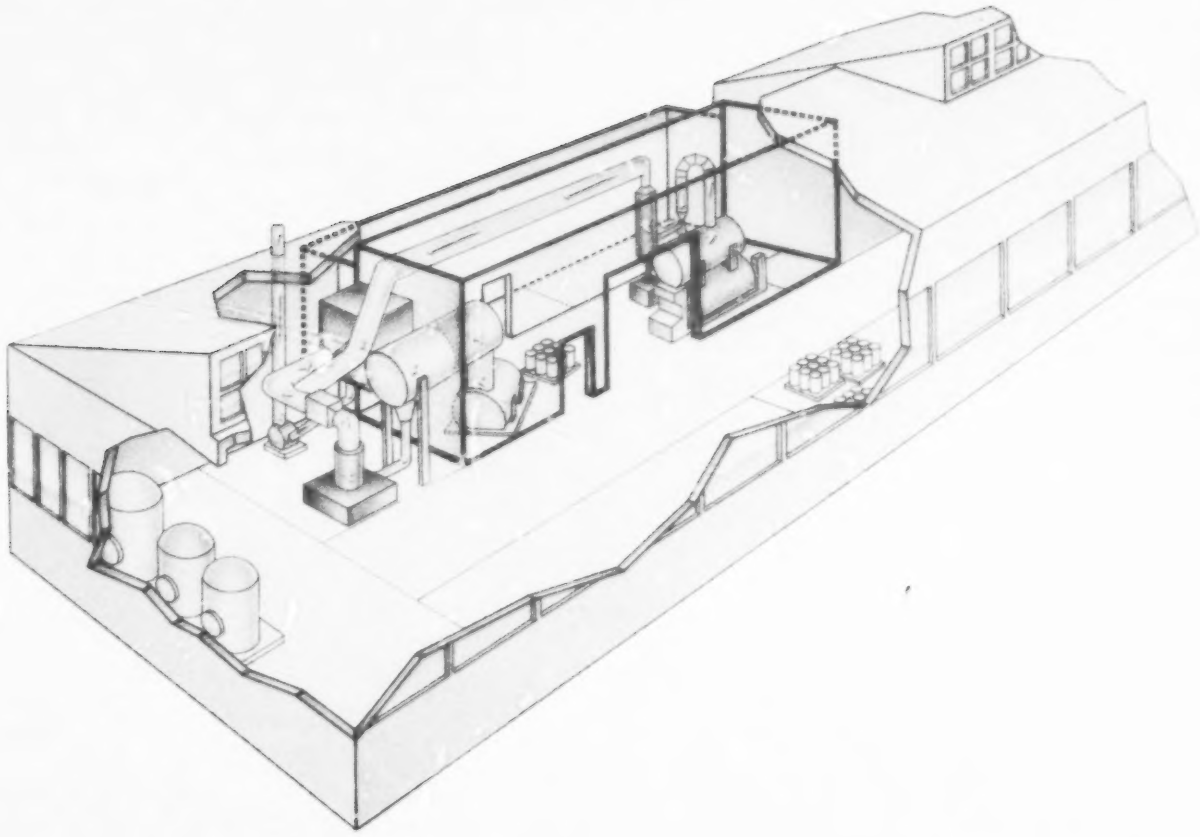
Risk Reduction
Engineering Laboratory
Cincinnati OH 45268

EPA/600/M-89/002
June 1989

Research and Development

EPA

Description of Risk Reduction Engineering Laboratory Test and Evaluation Facilities



le
EP1.2:

USER GUIDE TO TREATABILITY STUDIES

CONTAMINANT CLASS	INCINERATION Combustion Res Facility	SOLIDIFICATION/ STABILIZATION Center Hill	BIODEGRADATION AWBERC/Containment Test & Evaluation	PHYSICAL/CHEMICAL AWBERC/Containment/ Test & Evaluation	GLYCOLATE DEHALOGENATION AWBERC/Containment	SOILS HANDLING. EXTRACTION Edison, NJ
Halogenated non-polar aromatics	X		A	*, S	X	X
PCB's, dioxins and furans	X	§	N		X	X
Halogenated phenols, cresols, other aromatics	X		N	*		X
Halogenated aliphatic compounds	X		N	*	X	X
Halogenated cyclic aliphates/ethers/esters ketones	X		A	S,†	X	X
Nitrated aromatics and aliphatics	X		A	*		X
Simple non-polar aromatics and heterocyclics	X		A	*, O, S		X
Polynuclear aromatic	X	X	A	O, *		X
Other polar organics	X		A			X
Non-volatile metals		X		I, R, P		X
Volatile metals		X		I, R		X
Other inorganics				†, I		X
Radionuclides		X				
Cyanide			X	O, †		
CONTACT/TELEPHONE	Robert C. Thurnau 513-569-7692	Edwin F. Barth 513-569-7669	Kenneth Dostal 513-569-7503	Kenneth Dostal 513-569-7503	Charles J. Rogers 513-569-7757	Richard Traver 201-321-6677

X General inclusion
§ Low concentration
A Aerobic
N Anaerobic
* Granular activated carbon
† Chemical oxidation
S Steam stripping
O Ozone
I Ion exchange
R Reverse osmosis
P Chemical precipitation

INTRODUCTION

This brochure is an overview of the test and evaluation facilities of the Cincinnati based Risk Reduction Engineering Laboratory (RREL), Office of Research and Development, U.S. EPA. While these facilities and capabilities vary greatly as to function and scope they have in common their abilities to serve the scientific and engineering needs of RREL client offices, both within EPA, and for other Federal, State and local organizations, and industry. Detailed information regarding permitted wastes and unit processes, for each facility location, is illustrated at the conclusion of this brochure.

The facilities described in this brochure are:

Cincinnati, Ohio area:

- Test and Evaluation Facility
- Center Hill Facility
- Full Containment Facility
- Drinking Water Pilot Plant (fixed and mobile)
- Mobile Wastewater Treatment Units
- Mobile Dehalogenation Treatment Units

Jefferson, Arkansas

- Combustion Research Facility

Edison, New Jersey

- Synthetic Soils Matrix (SSM) Blending Facility
- Underground Storage Tank Test Apparatus
- Environmental Technology and Engineering (E-TEC) Facility

RREL facilities are available to industry, academia, and other governmental agencies to pursue cooperative treatability studies or process control, and equipment research and development activities under terms of the Stevenson-Wydler Technology Innovation Act as ammended by the Federal Technology Transfer Act of 1986. Provisions of this act are summarized as follows:

These ammendments include, under the heading COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS, authority for ". . . Government-operated Federal laboratories — to enter into cooperative research and development agreements on behalf of such agency . . . with other Federal agencies; units of State or local government; industrial organizations . . . public and private foundations; nonprofit organizations (including universities) or other persons . . ." Thus, RREL has an even greater opportunity to work directly with those in need of the knowledge and skills our people have garnered doing hands-on research in a vast number of areas.

COVER

To indicate the scope and complexity of RREL's test and evaluation facilities we have included a cutaway view of the Jefferson, AR, Combustion Research Facility

TEST AND EVALUATION (T&E) FACILITY

LOCATION

USEPA Test and Evaluation Facility, 1600 Gest Street, Cincinnati, OH 45268

CONTACT

Francis L. Evans, III — Comm. 513-684-2621, FTS 684-2621

PURPOSE OF FACILITY

T & E supports the various programs of all research organizations located in the Cincinnati area but is operated by RREL and is predominantly concerned with studies in the areas of municipal/industrial wastewater and hazardous waste treatment.

CAPABILITY

A wide variety of wastewater treatment plant feed, recycle, and sludge streams are available for continuous study utilizing activated sludge, trickling filter, rotating biological contactor, and anaerobic digestion as well as physical-chemical unit operations such as steam stripping and carbon adsorption.

The abilities of staff and equipment allow T & E to function well in the areas of:

- Feasibility testing of new treatment concepts and equipment
- Process performance including failure mode analysis
- Parallel evaluations through controlled process studies
- Treatability studies

EQUIPMENT AVAILABLE

T & E designed with the flexibility to accommodate a rapidly changeable variety of bench- and pilot-scale studies. It has approximately 24,000 square feet of, two-story high experimental area, with wastewater streams piped into 16 stations. An additional 9,000 square feet are occupied by laboratories, offices, and dry chemical storage. Several large doors facilitate the movement of large equipment, including trailer-mounted pilot plants, thus allowing increased flexibility.

Specific equipment includes:

- Two five-ton bridge cranes for ease of moving equipment, both in and out of the facility
- Machine shop for specialized fabrication, modification or repair of experimental apparatus
- Greenhouse for agricultural studies of pollutant application to soils
- Readily available high and low pressure air, pure oxygen, natural gas, and electric power ducts (480V, 240V, and 120V) at each of 16 experimental bays
- Provision for installation of a microcomputer for process control, data logging, data manipulation, and report generation

PUBLIC AVAILABILITY

The facility is available on a program interest and space availability basis. A RCRA Part B Permit and RD&D Permit authorize handling of 49 wastes in 15 unit processes. A RCRA Part B Permit authorizing the treat-storage and disposal of most waste catagories in 49 unit processes has been applied for and is expected to be approved by July 1989.

USER FEE

The fee is negotiated on the basis of floor space and length of time of the proposed use.

TYPICAL PROJECTS

- Fate and effect of CERCLA compounds in activated sludge systems
- Anaerobic-aerobic treatment of leachate
- Evaluation of municipal sludge digestion alternatives
- Hazardous waste treatment technology assessment-physical separations
- The effects of municipal wastewater sludge on leachates and gas production from sludge-refuse landfills and sludge monofills
- Hazardous air emissions control studies
- Hazardous waste landfill leachate treatment with a rotating biological contactor
- Hazardous waste treatment technology assessment-inorganic treatment
- Anaerobic selector/aerobic biological treatment of azo dye/chlorinated organics

CENTER HILL RESEARCH FACILITY

LOCATION

USEPA Center Hill Research Facility, 5995 Center Hill Road, Cincinnati, Ohio 45224

CONTACT

Joseph K. Burkart — Comm. 513-569-7885, FTS 864-7885

PURPOSE OF FACILITY

An onsite team of multidisciplined engineers and scientists conduct research and provide technical services in the areas of testing, design, and field implementation for both solid and hazardous waste management.

Engineering services focus on the design and implementation of site remediation, and land pollution control. Existing technologies are evaluated for their performance in the containment and control of pollution to the land.

Technical assistance to EPA Regional Offices includes lab and field services remedial action program design and construction. Computer-aided-engineering services are also provided for mapping and modeling to assist in site-situation assessment and remedial actions.

CAPABILITY

Center Hill houses labs that are specially equipped for geotechnical testing of soil wastes to evaluate the physical effects of chemicals on soils and to assess the soil-chemical interaction and the mechanisms of chemical release in the geohydrological environment.

The Facility also accommodates bench and pilot-scale testing to evaluate the performance of technologies for waste treatment and site remediation.

Major areas of activity are:

- Chemical solidification and stabilization (CSS)
- Pollution control technologies (PCT)
- Technology evaluation for remedial actions (TERA)
- Computer assisted engineering (CAE)

EQUIPMENT AVAILABLE

Facility features include:

- Geotechnical testing lab
- Hazardous waste lab
- Chemical stabilization solidification facilities
- Hazardous waste storage building
- High bay area
- Lysimeter cells
- Pressurized test tank
- Slurry wall test flume
- Outdoor lysimeters
- Chemical leaching extraction lab

PUBLIC AVAILABILITY

The facility is available on a program interest and space availability basis. A RCRA Part B Permit has been applied for to conduct aerobic/anaerobic treatability tests, solidification/stabilization tests, and permeability studies of earthen barriers and is expected to be approved by January 1990.

USER FEE

The fee is negotiated on the basis of floor space and length of time of the proposed use.

TYPICAL PROJECTS

- Lab assessment of solidification/stabilization (S/S) systems
- Alternative leaching scenarios development for S/S hazardous soil wastes
- Data base development for S/S performance
- Construction quality assurance programs for remedial action Superfund projects
- Evaluation and demonstration of S/S techniques to treat municipal waste combuster ash
- Slurry wall design and construction methods
- Evaluation of organics effects on slurry walls
- Effects of aggressive permeant liquids on bentonite/soils
- Computer assisted engineering remedial action assessment
- Innovative delivery and recovery systems: hydrofracturing

FULL CONTAINMENT FACILITY

LOCATION

Andrew W. Breidenbach Environmental Research Center, Cincinnati, OH 45268

CONTACT

Alden G. Christianson — Comm. 513-569-7406, FTS 684-7406

PURPOSE OF FACILITY

The Breidenbach Center operates a full containment facility for research on highly toxic or hazardous materials.

The 7,500 sq. ft. facility, constructed in 1988, is designed for analytical and experimental work, conducted primarily by Environmental Monitoring Systems Laboratory and Risk Reduction Engineering Laboratory respectively on chemicals or wastes which cannot be safely handled in normal laboratory facilities. This includes the capability to analyze and characterize unknown waste samples from Superfund sites or other locations and the ability to conduct laboratory-scale treatment and treatment-related research on waste surrogates.

CAPABILITY

The EMSL-program component of the Containment Facility has the capability of providing analytical services on highly toxic or hazardous waste samples.

The RREL-program component of the Containment Facility has the capability of conducting a broad range of lab-scale, experimental studies on high-hazard wastes in a setting designed for safety and control.

EQUIPMENT AVAILABLE

The major equipment items in the Full Containment Facility are analytical instruments in service under EMSL. Included are gas chromatographs, GC/MS, HPLC/MS, Matrix Isolation Fourier Transform Infrared/Mass Spectrometer, Sequential Inductively Coupled Plasma System, Total Organic Carbon Analyzer, UV Spectrometer, Ion Chromatograph and Total Organic Halogen Analyzer. Other equipment in the Facility (e.g., that used in RREL engineering research) will be variable and transient depending on the particular experimental work being conducted.

PUBLIC AVAILABILITY

The facility is available on a program interest and space availability basis. Treatability studies on actual hazardous wastes cannot be conducted until a RCRA Part B application has been approved, expected date for that approval is January 1990.

USER FEE

The fee is negotiated on the basis of floor space and length of time of the proposed use.

TYPICAL PROJECTS

- Removal of Asbestos From Surfaces — Using a glove box in a controlled, negative pressure atmosphere, the effectiveness of various techniques (vacuum, chemical, wet dusting, electrostatic) will be studied for cleaning carpets, desk tops, ceilings, etc.
- Stored Drum Treatment Tests — Using small scale reactors, effectiveness of sequential chemical (KPEG) and biological treatment in destroying organics such as 2, 4-D and 2, 4, 5-T will be determined; also, reactor modes of operation will be compared.
- Lead Removal From Contaminated Soil — Using a small scale furnace and scrubber, the feasibility of Pyrometallurgical extraction of lead, and the chemical steps involved in the process, will be determined.
- Biokenetics of Toxic Compounds — Using respirometry apparatus and measurement units, kinetic parameters and inhibitory effects related to biodegradation of RCRA and CERCLA compounds will be determined.
- Hazardous Waste Treatment — Using lab-scale reactors, chemostats, and respirometers, biodegradability of complex toxic wastes in both aerobic and anaerobic processes will be studied.

DRINKING WATER PILOT PLANTS

LOCATION

USEPA, Andrew W. Breidenbach Environmental Research Center, Cincinnati, OH 45268

CONTACT

Robert M. Clark — Comm. 513-569-7201, FTS 684-7201

PURPOSE OF FACILITY

These facilities are used to provide the Office of Drinking Water with data on the effectiveness of various treatment processes for control of organic and inorganic contaminants under study for inclusion in national drinking water standards under the Safe Drinking Water Act.

CAPABILITY

This group of pilot plants are used to conduct research on treatment techniques for removing various organic and inorganic contaminants from drinking water. Both inhouse and mobile (inorganic) pilot plant systems are available.

In the field of organic contaminants the treatment processes include conventional treatment, filter/adsorbers, diffused air aeration, ozonation, and reverse osmosis.

There are special installations used to evaluate various methods for removing inorganic chemicals (e.g. lead, arsenic, selenium, etc.) radionuclides (radium, uranium, and radon), and particulates (inert turbidity, **Giardia, Cryptosporidium,** etc.). The concentration of chemicals studied are normally similar to those found in water sources throughout the nation.

EQUIPMENT AVAILABLE

In-house Facilities (Organic)

Several pilot-scale testing units are employed for the study of control of organic contaminants in drinking water. Dealing with part-per-billion concentrations of organic contaminants, all equipment is constructed primarily of stainless steel, teflon and glass to minimize contamination. **Thus, any proposed use should only involve those studying similar concentrations of organic contaminants.**

In-house Facilities (Inorganic)

This in-house pilot plant is comprised of two separate coagulation systems utilizing rapid mix, chemical addition, slow mix, settling, and filtration. Each system has a nominal capacity of two gpm and three interconnected filters and are used only for inorganic chemical removal. The use of metals, in construction of the equipment, is minimized to reduce the possibility of contamination by the plumbing materials. These systems are arranged so any individual component may be bypassed to provide a multitude of treatment scenarios.

In addition to the large pilot systems, this in-house plant houses a 150 gpd slow sand filter, two small reverse osmosis units (one gpm each), a large reverse osmosis unit (6,000 gpd), and a ten gpm diatomaceous earth filter. All of the units are connected to various pumps and water storage: a 6,000 gallon stainless steel tank located inside, and shares outside tanks of 3,000, 7,000 and 2,800 gallons capacity.

Mobile Facilities

RREL also manages two mobile pilot plants one of which is a box trailer in which several treatment systems have been installed (i.e. ion exchange, activated alumina, reverse osmosis, electrodialysis, and others).

The second mobile plant is a self-contained 20 gpm package plant that utilizes conventional coagulation followed by sedimentation and filtration to treat drinking water. This mobile plant is currently stored at Cincinnati, Ohio.

PUBLIC AVAILABILITY

The facilities are available on a program interest basis.

USER FEE

The fee is negotiated on the basis of floor space and length of time of the proposed use.

TYPICAL PROJECTS

The pilot plant is being used to study the removal and control of disinfection byproducts from drinking water.

The in-house pilot plant is currently being used to study the removal of **Giardia** and other organisms from drinking water.

The mobile water treatment systems pilot plant was used to study the removal of radium.

MOBILE WASTEWATER TREATMENT UNITS

LOCATION

USEPA, Andrew W. Breidenbach Environmental Research Center, Cincinnati, OH 45268

CONTACT

Glenn M. Shaul — Comm. (513) 569-7408 FTS 684-7408

PURPOSE OF FACITLITY

This equipment provides for a wide variety of treatability options for onsite treatment of wastewaters. Most equipment was designed to allow for compatibility for flows and loading allowing several combinations of unit processes. Operation and maintenance manuals, including design specifications are available.

CAPABILITY

Four mobile forty foot treatment trailers with several unit processes are available. All units are skid mounted which allows for flexibility in the selection of the desired unit process.

EQUIPMENT AVAILABLE

- Physical/Chemical Trailer. This trailer contains: a dual media filter system, four carbon adsorption columns, clarifier system, and several tanks, mixers and pumps.
- Ozone Trailer. This trailer contains an ozone generating system, reverse osmosis system, magnetic filter system, clarifier and several tanks.
- Activated Sludge & Anaerobic Digestion Trailer. This trailer contains four 200 liter activated sludge process systems and two 40 liter anaerobic sludge digestion systems.
- Textile Trailer. This trailer contains: an ozone contact column, activated carbon columns, multi-media filter system, clarifier, and several holding tanks.

PUBLIC AVAILABILITY

Items I, II, IV above are available immediately. Item III will not be available until October 1989.

USER FEE

The fee is negotiated on the basis of the length of time of the proposed use.

TYPICAL PROJECTS

The equipment has been used in determining the treatability of iron and steel wastewaters, pharmaceutical wastewaters and textile wastewaters.

MOBILE DEHALOGENATION TREATMENT UNITS

LOCATION

USEPA, Andrew W. Breidenbach Environmental Research Center, Cincinnati, OH 45268

CONTACT

Charles J. Rodgers — Comm. 513-569-7757, FTS 684-7757

PURPOSE OF UNITS

The two dehalogenation treatment units provide for on-site treatability studies of soils, sludges, sediments or liquids wastes contaminated with halogenated pollutants. The most technically and economically feasible site cleanup can better be established with these units.

CAPABILITY

Two mobile units processes are owned by the U.S. Environmental Protection Agency and are available by appointment. These units are trailer or skid mounted and offer needed flexibility for on-site processing of waste.

EQUIPMENT AVAILABLE

- Bench-scale trailer. This 45 foot trailer is equipped with a 40 gallon reactor, solids trap, condensor, carbon adsorption unit, and laboratory for on-site analysis of contaminated matrices before and after treatments.
- Pilot-scale unit. This 25 foot skid mounted 400 gallon reactor is steam jacketed, equipped with mixing blades (7) with ½ inch wall clearance. Other components of the treatment system are steam generator, solids trap, condensor, feeding hopper, and carbon adsorption unit.

PUBLIC AVAILABILITY

The 40 gallon reactor described above is available immediately. The 400 gallon pilot-scale system will not be available until July 1989.

USER FEE

The fee is determined on the basis of materials and labor requirements.

TYPICAL PROJECTS

The equipment has been used to treat PCB-contaminated soil in Guam, Moreau, New York and pesticide contaminated waste in EPA regions IV, V and VII.

COMBUSTION RESEARCH FACILITY (CRF)

LOCATION

USEPA Combustion Research Facility (located in conjunction with National Center for Toxicological Research), Jefferson, AR 72079, Comm. 501-541-0004, no FTS

CONTACT

Robert C. Thurnau — Comm. 513-569-7692, FTS 684-7692

PURPOSE OF FACILITY

Pilot plant testing is used to test various listed hazardous wastes and certain organic and metals "soups" that address RCRA and SARA needs. Evaluations are carried out in the Rotary Kiln System (RKS) and the Liquid Injection System (LIS). Assessment of in-line and slipstream pilot air pollution control devices (APCDs) such as venturi scrubbers, packed towers, ionizing wet scrubbers, spray dryer/fabric filters, and electrostatic precipitators, will also be conducted. Testing will be directed at determining the impact of the following variables, POHC, PIC, and metals emissions, as a function of:

- Chlorine content of the feed material
- Afterburner and kiln temperatures
- Excess air
- Feed matrix
- APCD operation

Pollutant removal efficiencies for major classes of PICs and metals will be determined for each APCD tested.

CAPABILITY

Full RCRA Part B permits have been issued for the rotary kiln and liquid injection systems. These incineration systems and their support activities occupy 12,000 square feet, under roof.

EQUIPMENT AVAILABLE

Two pilot scale incinerators

- Rotary kiln system (RKS) - with afterburner - 1.8 mmBtu/hr. waste
- Liquid injection system (LIS) - 3.5 mmBtu/hr. waste

Air pollution control systems

- Venturi scrubber and packed tower on RKS
- Packed tower and ionizing wet scrubber on LIS
- Facility APCD system (carbon bed/HEPA filter) provides additional environmental protection for the operation of individual units in experimental modes
- Other APCD as available

On site analytical chemistry capability for metals as well as volatile and semivolatile organic compounds.

PUBLIC AVAILABILITY

The facility is available on a program interest and time available basis. Current time availability is twelve weeks per year.

Legislative Mandates: RCRA, HSWA, CERCLA, SARA, FIFRA, TSCA, CAA

- permit modification being processed to allow:
  - mobile combustors
  - mobile APCDs
  - treatment of generated wastes
  - expanded operating area and waste storage
- types of testing available:
  - hazardous waste "state-of-practice" testing
  - hazardous waste "state-of-technology" testing
  - parametric evaluation of combustion conditions
  - parametric evaluation of air pollution control systems

USER FEE

$6,000 per day the CRF is committed to each individual project. Actual facility operating time per test is approximately 10 days.

TYPICAL PROJECTS

A total of 138 tests, covering K037, K086, K087, K001 wastes plus synthetic mixtures, have been completed in the past four years.

TREATABILITY CAPABILITIES FOR SYNTHETIC SOILS MATRIX (SSM) BLENDING FACILITY

LOCATION

USEPA, RREL, Wooobridge Avenue, Edison, New Jersey 08837-3679

CONTACT

Richard P. Traver — Comm. 201-321-6677, FTS 340-6677

PURPOSE OF FACILITY

The system is designed to mix soils, sludges and sediments with chemical analytes to produce spiked matrices, as required.

CAPABILITY

The SSM system is a mixing system equipped with ventilation, nitrogen blanketing, stainless steel construction, primary laboratory support facilities, and level B personnel protection and decontamination capabilities.

We are currently storing 25,000 lbs of clean soil matrix consisting of defined concentrations of soil components based on an extensive statistical research of soil characterizations of Superfund sites throughout the country is available. This soil consists of sand, No. 9 gravel, silt, top soil and clays. The system is also storing a series of volatile organic, semivolatile organic and metal salt analytes that also represent the results of an extensive compilation of chemicals found in Superfund sites throughout the country. These analytes include acetone, chlorobenzene, ethylbenzene, styrene, tetrachloroethylene, xylene, anthracene, hexachlorobenzene, bis-(2ethylhexyl) phthalate, and arsenic, cadmium, chromium, copper, lead, nickel, and zinc metal salts.

The system is capable of operation at all times during the year.

EQUIPMENT AVAILABLE

The SSM system consists of a mixing room, a decontamination area, a clean/support area, and an administrative/office trailer. The mixing room contains a tilt-tub explosion proof batch mixer with internal paddles and is entirely constructed of 316 stainless steel for a broad chemical material compatibility. The mixer has a 10 cu. ft. capacity and is capable of mixing 500 lbs of solid matrix per batch. Access to the mixer in the operating position is aided by a platform built around the unit. An explosion suppression nitrogen gas system is provided to blanket the mixer air space during mixing. A ventilation system in the mixing room provides for more than 30 air exchanges per hour. The floor of the mixing room and the contamination reduction area is covered with a combination plywood and plastic sheeting to protect the concrete floor from analyte penetration. Sheets of formica cover the plywood and the mixing room walls in critical spill/splash areas to accommodate rapid and complete decontamination. The system is equipped with level B umbilical airline support and complete personnel and equipment decontamination capabilities. Additionally, the mixing room contains work tables for materials staging, sample collection and preparation with storage cabinets for flammable liquids and analyses. Primary laboratory capabilities for the preparation and measuring of liquid and solid analyses area also available. The system has provisions for packaging and shipping prepared blends, in any type of container or quantities as specified. A complete inventory of health and safety equipment and supplies consistent with level B and level C personnel protection and decontamination is available. Process operations that can be accommodated by the above system include: blending and mixing operations to create standard analytical or Superfund defined matrices consisting of soils, sludges, sediments and organic and inorganic analyses; mixing operations to support solidification/stabilization studies; primary mixing/contacting to support biological treatability studies; agitation to suppport vacuum extraction of volatiles from a solid matrix; mixing and contacting of reagents with contaminated soils to support extraction, washing and other chemical/physical contaminant reduction technology treatability studies.

PUBLIC AVAILABILITY

This is a soil/contaminant mix generation service provided by RREL for treatability testing elsewhere with the resulting sample matrix.

USER FEE

The cost to prepare 2,000 lbs of spiked SSM during a 1 week operation of the blending system is approximately $15,000. This includes operating labor costs, packaging and shipping costs, chemicals costs, miscellaneous materials and supplies, and support laboratory analyses.

TYPICAL PROJECTS

Th SSM system is completely operational and capable of full-scale blending of solid matrices and analytes.

UNDERGROUND STORAGE TANK TEST APPARATUS

LOCATION

USEPA, RREL, Woodbridge Avenue, Edison, New Jersey 08837-3679

CONTACT

Anthony N. Tafuri — Comm. 201-321-6604, FTS 340-6604

PURPOSE OF FACILITY

An onsite team of multidisciplined engineers and scientists conduct research and provide technical services in the areas of test protocol conception and design, testing, field implementation, and operation of the UST apparatus.

Engineering services focus on the evaluation of leak detection methods and the experimental investigation of the ambient conditions that have a profound affect on the performance capability of these test methods.

Results generated from evaluations at the UST apparatus support the creation of a practical framework for leak detection in the federal UST regulation.

CAPABILITY

The Underground Storage Tank (UST) test apparatus is a controlled condition test apparatus designed and fabricated with UST's and other associated equipment to provide control over the primary variables affecting leak detection in underground storage tanks. The apparatus allows, as far as is practical, contro. be be exercised over the major factors that affect the accuracy and detection threshold of volumetric leak detection methods.

The design incorporates underground tanks and above-grade components to enable this control to be exercised. In addition to the UST's at the apparatus is the underground storage tank piping system (USTPS). As with the UST appurtenances, the USTPS has associated equipment to provide control over the variables that affect line leak detection methods. Under specific simulated conditions, the operators can evaluate the performance of commercial line leak detection methods for both pressurized and non-pressurized line systems.

EQUIPMENT AVAILABLE

The UST apparatus is equipped with two research trailers, a computer network system, operation controls, a technician's workshop, storage, and emergency equipment.

PUBLIC AVAILABILITY

Generally, two to four commercial leak detection methods can be tested, or a series of ambient investigations can be conducted over a one week period with a complimentary crew of eight people.

USER FEE

The cost of one commercial volumetric leak detection method evaluation is based upon the following: Gathering of background data, development of a mathematical model, verification testing, model validation, and performance estimate. Estimated Cost: $80,000.

ENVIRONMENTAL TECHNOLOGY AND ENGINEERING (E-TEC) FACILITY

LOCATION

USEPA, RREL, Woodridge Avenue, Edison, New Jersey 08837-3679

CONTACT

James J. Yezzi, Jr. — Comm. 201-321-6703, FTS 340-6703

PUROSE OF FACILITY

The E-TEC Facility will be a specialized location designed to provide state-of-the-art capabilities to test and evaluate hazardous waste control technologies in a safe and environmentally secure manner. The facility will be equipped with testing areas and backup treatment systems such that spills and other accidental releases associated with testing of experimental equipment will be contained and treated without being released to the environment.

The facility, currently under development, will primarily serve research and development programs funded by the Superfund program, but can receive assignments for the non-Superfund areas.

CAPABILITY

E-TEC will be constructed at the RREL facilities at Edison, New Jersey, and will include both indoor and outdoor areas on a roughly 115 acre site. Indoor areas will include office spaces, a technology information exchange function, laboratory spaces, areas for training activities, shop spaces, specialized testing areas for bench, pilot scale and full scale technologies for treatment or control of environmental contaminants, specialized "backup treatment systems" to control any emissions or byproducts that arise from testing such that no contaminants are released to the environment, storage areas for hazardous materials, storage areas for equipment and other specialized spaces as needed. Outdoor areas will include an existing underground storage tank test apparatus, areas for training of response personnel (to be done by OSWER's Environmental Response Branch), areas for testing prototypical technologies, and other related areas.

The schedule for the facility development is as follows:

- Architectural and engineering work will be completed by mid-FY 1989
- Construction should be completed by late FY 1990
- Startup, permit compliance testing and permit-related authority to proceed should be completed by February 1991
- Testing and other developmental activities should be in full operation during FY 1992

EQUIPMENT AVAILABLE

Testing and evaluations will be at bench, pilot and full scales. Technologies to be researched, developed, tested and/or evaluated include physical, chemical, thermal and biological processes, used individually or in combination, as flow-through systems or as in-site treatments, for chemical, microbiological, radiological or other contaminants, individually or in combination. The contaminants may be in any media, including air, water, soils, sludges or sediments. Emphasis will continue on research pertaining to treatment of excavated soils and treatability studies in support of EPA's Regions.

The facility will include 150,000 ft^2 of testing and evaluation bays as well as 25,000 ft^2 of laboratory space. The laboratory facilities will include a full containment anlaytical laboratory, regular analytical labs and a bench/pilot unit testing lab.

PUBLIC AVAILABILITY

In general the E-TEC Facility is intended to be used by anyone internal or external to EPA that needs such a specialized facility for the development and testing of environmental contamination control technologies. Use by outside parties will be on both a subsidized and reimbursable basis, dependent upon available funds and EPA program priorities.

USER FEE

The on-site E-TEC Facility operating contractor will make such financial and legal arrangements as needed and as directed by EPA to arrange for commercial environmental contamination control systems to be tested and evaluated at the Facility using third party user agreements and other authorities such as those contained in the Federal Technology Transfer Act.

Figure 1

USEPA

Risk Reduction Engineering Laboratory

TEST AND EVALUATION (T&E) FACILITY - CINCINNATI, OH

HAZARDOUS WASTE TREATMENT RESEARCH CAPABILITY

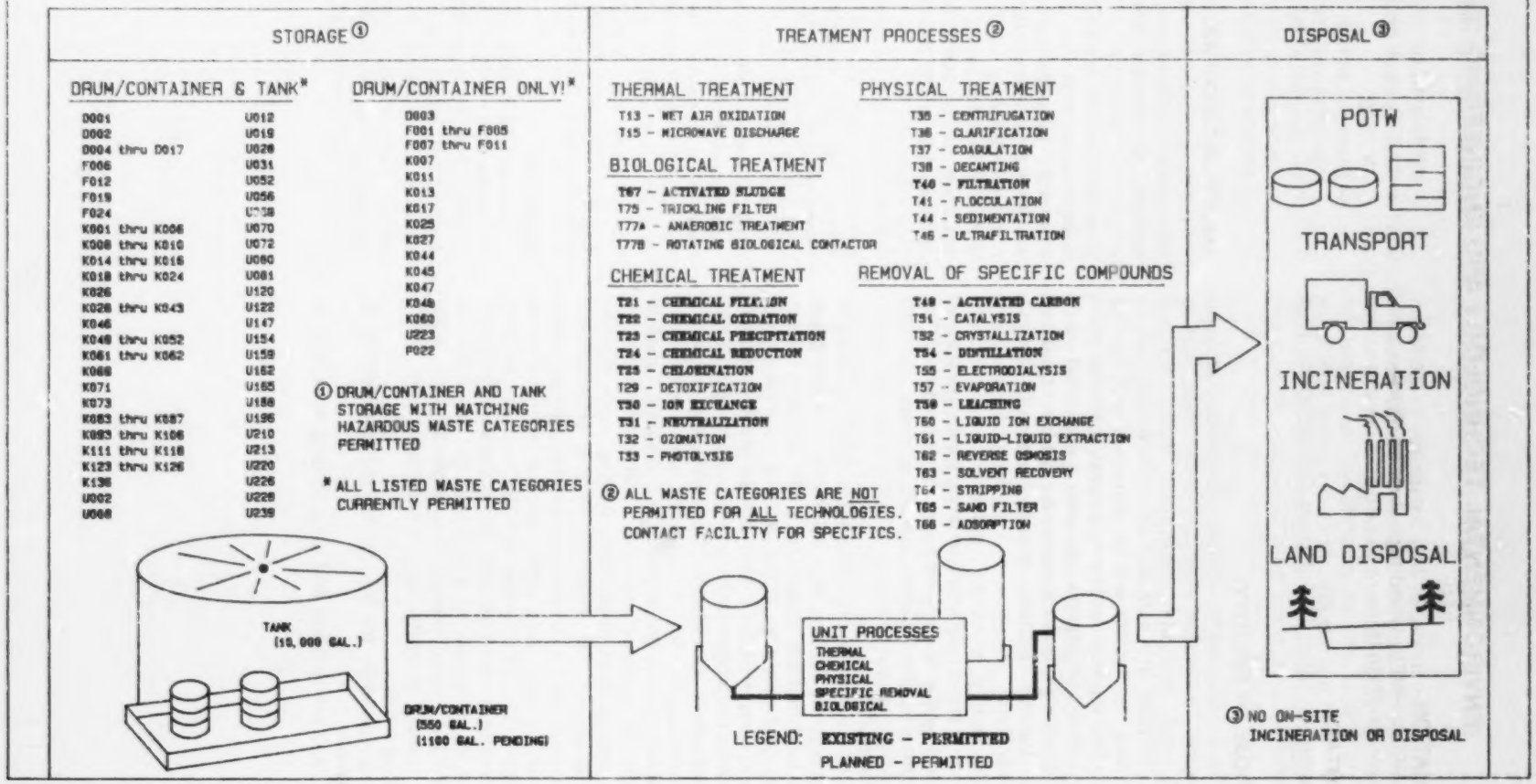

STORAGE ①
DRUM/CONTAINER & TANK*
D001 D002 D004 thru D017 F006 F012 F019 F024 K001 thru K006 K008 thru K010 K014 thru K016 K018 thru K024 K026 K028 thru K043 K046 K048 thru K052 K061 thru K062 K066 K071 K073 K083 thru K087 K093 thru K106 K111 thru K118 K123 thru K126 K136 U002 U008 U012 U019 U028 U031 U052 U056 U070 U072 U080 U081 U120 U122 U147 U154 U159 U162 U165 U188 U196 U210 U213 U220 U226 U228 U239
DRUM/CONTAINER ONLY!*
D003 F001 thru F005 F007 thru F011 K007 K011 K013 K017 K025 K027 K044 K045 K047 K048 K060 U223 P022
① DRUM/CONTAINER AND TANK STORAGE WITH MATCHING HAZARDOUS WASTE CATEGORIES PERMITTED
* ALL LISTED WASTE CATEGORIES CURRENTLY PERMITTED
TANK (10,000 GAL.)
DRUM/CONTAINER (550 GAL.) (1100 GAL. PENDING)
TREATMENT PROCESSES ②
THERMAL TREATMENT
T13 - WET AIR OXIDATION
T15 - MICROWAVE DISCHARGE
BIOLOGICAL TREATMENT
T07 - ACTIVATED SLUDGE
T75 - TRICKLING FILTER
T77A - ANAEROBIC TREATMENT
T77B - ROTATING BIOLOGICAL CONTACTOR
CHEMICAL TREATMENT
T21 - CHEMICAL FIXATION
T22 - CHEMICAL OXIDATION
T23 - CHEMICAL PRECIPITATION
T24 - CHEMICAL REDUCTION
T25 - CHLORINATION
T29 - DETOXIFICATION
T30 - ION EXCHANGE
T31 - NEUTRALIZATION
T32 - OZONATION
T33 - PHOTOLYSIS
PHYSICAL TREATMENT
T35 - CENTRIFUGATION
T36 - CLARIFICATION
T37 - COAGULATION
T38 - DECANTING
T40 - FILTRATION
T41 - FLOCCULATION
T44 - SEDIMENTATION
T46 - ULTRAFILTRATION
REMOVAL OF SPECIFIC COMPOUNDS
T49 - ACTIVATED CARBON
T51 - CATALYSIS
T52 - CRYSTALLIZATION
T54 - DISTILLATION
T55 - ELECTRODIALYSIS
T57 - EVAPORATION
T59 - LEACHING
T60 - LIQUID ION EXCHANGE
T61 - LIQUID-LIQUID EXTRACTION
T62 - REVERSE OSMOSIS
T63 - SOLVENT RECOVERY
T64 - STRIPPING
T65 - SAND FILTER
T66 - ADSORPTION
② ALL WASTE CATEGORIES ARE NOT PERMITTED FOR ALL TECHNOLOGIES. CONTACT FACILITY FOR SPECIFICS.
UNIT PROCESSES
THERMAL
CHEMICAL
PHYSICAL
SPECIFIC REMOVAL
BIOLOGICAL
LEGEND: EXISTING - PERMITTED
PLANNED - PERMITTED
DISPOSAL ③
POTW
TRANSPORT
INCINERATION
LAND DISPOSAL
③ NO ON-SITE INCINERATION OR DISPOSAL

Figure 2

USEPA

Risk Reduction Engineering Laboratory

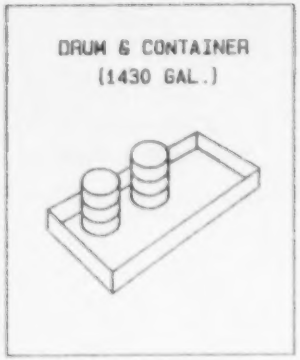
CENTER HILL FACILITY - CINCINNATI, OH

HAZARDOUS WASTE TREATMENT RESEARCH CAPABILITY

STORAGE ①

DRUM & CONTAINER*

D001 thru D003
D005 thru D017
F001 thru F006
F019
K002 thru K008
K046
K048 thru K052
K060 thru K062
K069
K084
K087
K101 thru K102



① DRUM AND CONTAINER STORAGE WITH MATCHING HAZARDOUS WASTE CATAGORIES PERMITTED OR PERMIT PENDING.

* CURRENTLY PERMITTED: D002, F002, F003, U002
OTHERS - PERMIT PENDING

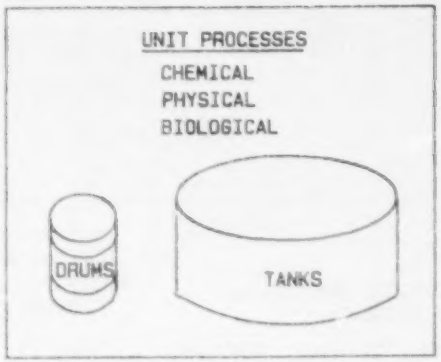
TREATMENT PROCESSES

CHEMICAL TREATMENT

T-21 CHEMICAL FIXATION (ASPHALT*, OTHER)

PHYSICAL TREATMENT

T-47 PHYSICAL BARRIERS

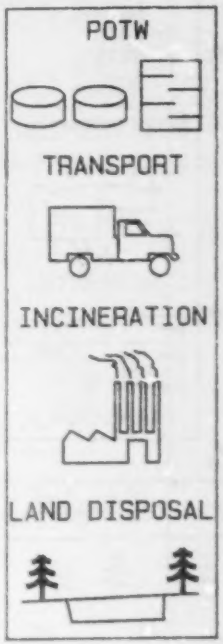


BIOLOGICAL TREATMENT

T-77A AEROBIC TREATMENT OF SOILS*
T-77B ANAEROBIC TREATMENT OF SOILS

* EXISTING - PERMITTED
OTHERS - PLANNED - PERMIT PENDING

DISPOSAL ②



② NO ON-SITE INCINERATION OR DISPOSAL

Figure 3

USEPA

Risk Reduction Engineering Laboratory

ANDREW W. BREIDENBACH ENVIRONMENTAL RESEARCH CENTER & CONTAINMENT FACILITY - CINCINNATI, OH

HAZARDOUS WASTE TREATMENT RESEARCH CAPABILITY

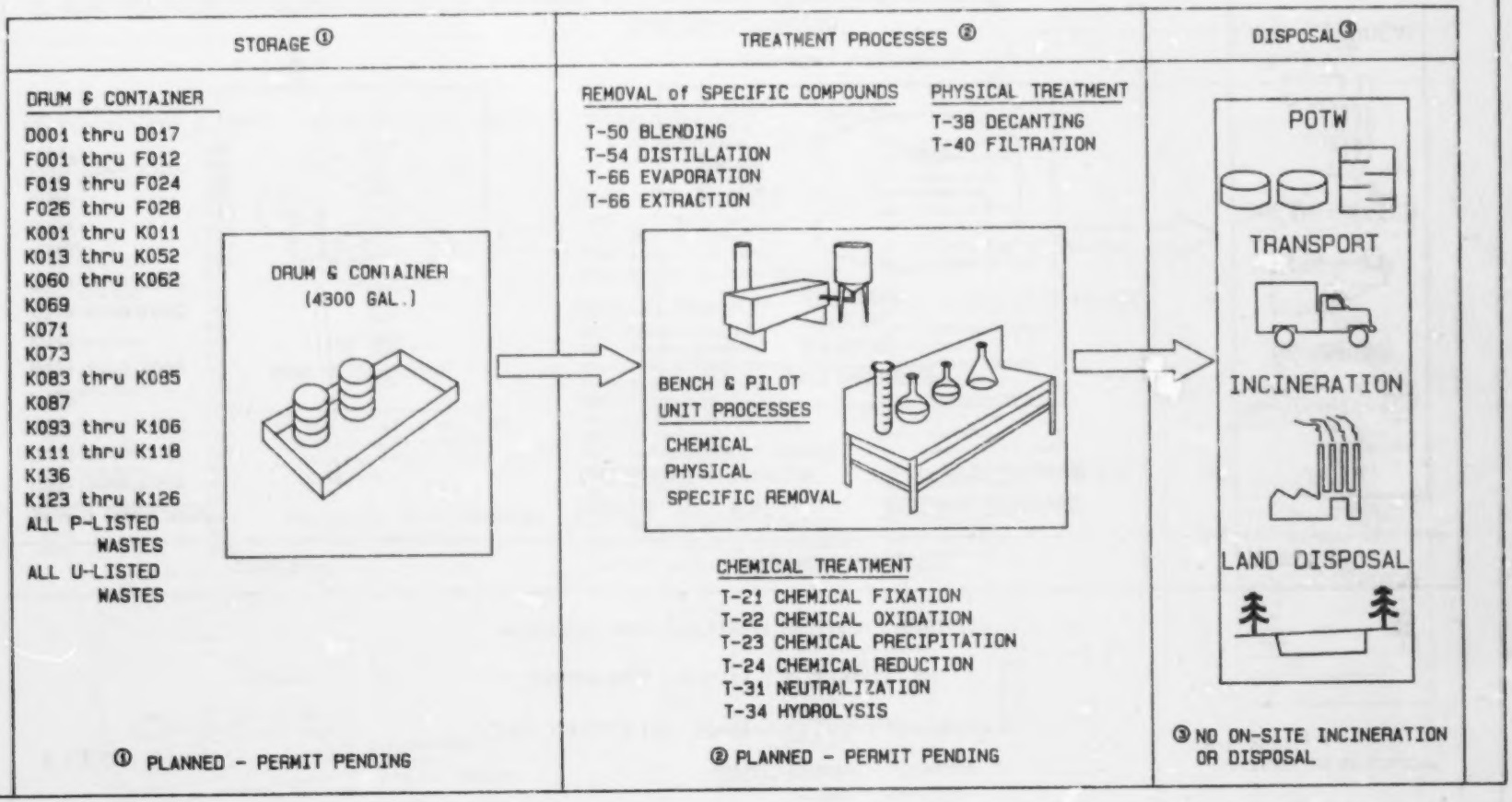


Figure 4

USEPA

Risk Reduction Engineering Laboratory

COMBUSTION RESEARCH FACILITY - JEFFERSON, AR

HAZARDOUS WASTE TREATMENT RESEARCH CAPABILITY

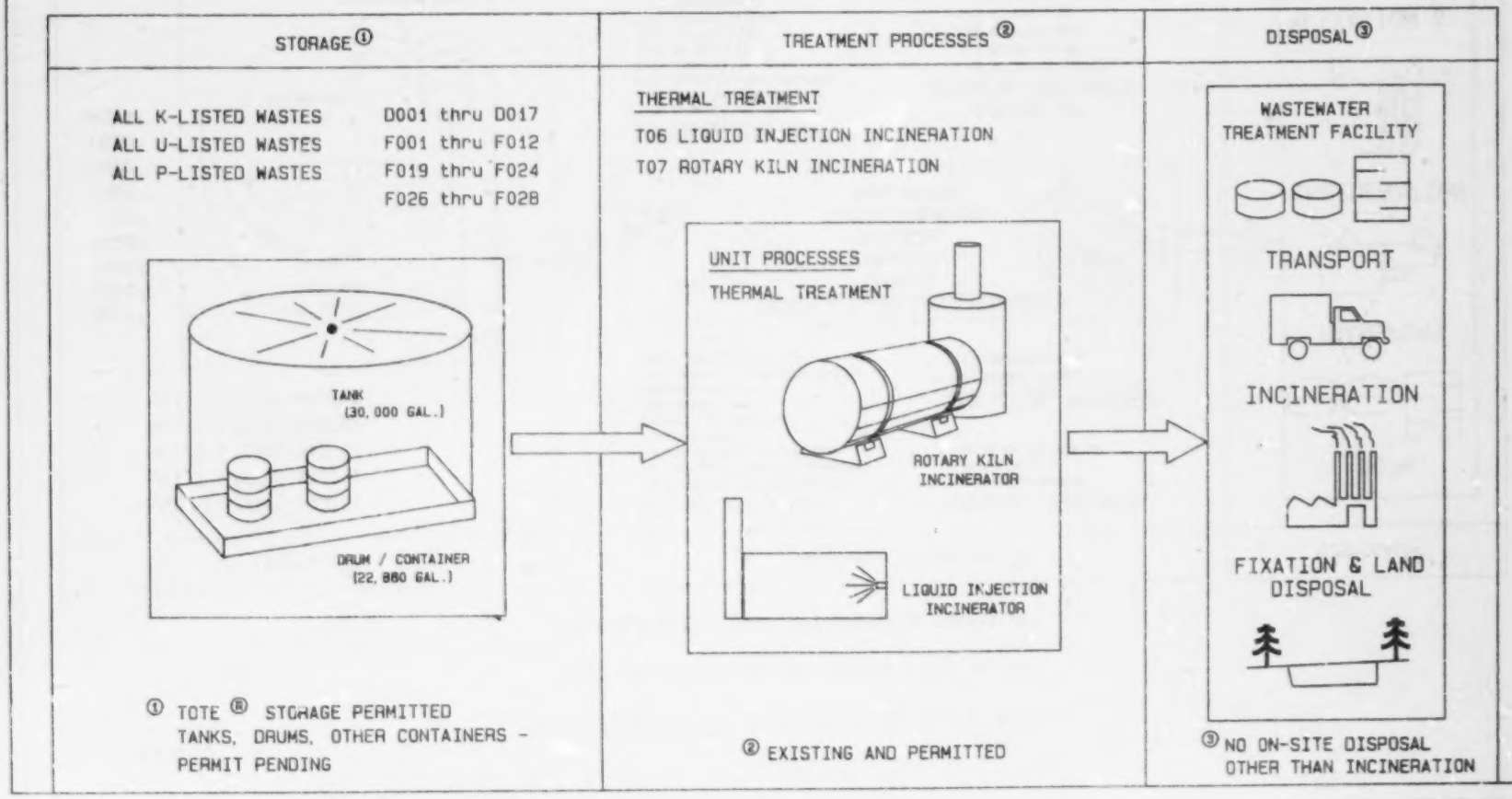


Figure 5

USEPA

Risk Reduction Engineering Laboratory

TEST AND EVALUATION FACILITIES - EDISON, NJ

HAZARDOUS WASTE TREATMENT RESEARCH CAPABILITY

STORAGE ①

ALL D LISTED WASTES
ALL F LISTED WASTES
ALL K LISTED WASTES
ALL P LISTED WASTES
ALL U LISTED WASTES

D001*
F001*
F002*
F003*
F005*
F020*
F022*
F026*
F027*

① STORAGE WITH MATCHING WASTE CATAGORIES

* PERMITTED (MISSOURI ONLY)
OTHERS - PERMIT PENDING

TREATMENT PROCESSES ②

THERMAL TREATMENT

T08 FLUIDIZED BED INCINERATOR
T10 INFRARED FURNACE INCINERATOR
T11 MOLTON SALT DESTRUCTOR
T12 PYROLYSIS
T13 WET AIR OXIDATION
T18A PLASMA ARC
T18B MOLTEN GLASS
T18C INSITU THERMAL DESTRUCTION
T18D ELECTRICAL REALTOR

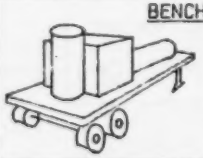
PHYSICAL TREATMENT

T-35 CENTRIFUGATION
T-40 FILTRATION
T-46 ULTRA FILTRATION

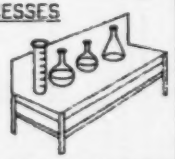
BIOLOGICAL TREATMENT

T-69 AEROBIC TANK
T-77 ANAEROBIC TANK

BENCH & PILOT UNIT PROCESSES



THERMAL
CHEMICAL
PHYSICAL
SPECFIC REMOVAL
BIOLOGICAL



CHEMICAL TREATMENT

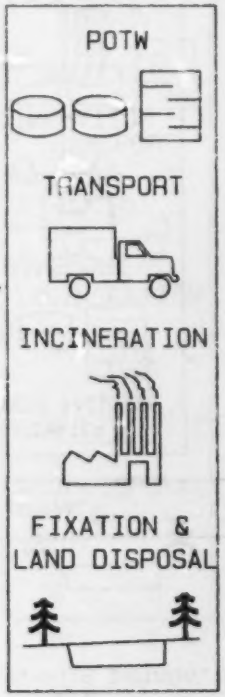
T-21 CHEMICAL FIXATION
T-22 CHEMICAL OXIDATION
T-23 CHEMICAL PRECIPITATION
T-24 CHEMICAL REDUCTION
T-25 CHLORINATION
T-30 ION EXCHANGE
T-31 NEUTRALIZATION
T-32 OZONATION
T-33 PHOTOLYSIS
T-34A POLYMERIZATION
T-34B DECHLORINATION
T-34C SORPTION
T-34D SUPER CRITICAL WATER
T-34E VITRIFICATION
T-34F HYDROLYSIS

REMOVAL OF SPECIFIC COMPONENTS

T-48 ACTIVATED CARBON
T-54 DISTILLATION
T-56 ELECTROLYSIS
T-57 EVAPORATION
T-63 SOLVENT RECOVERY
T-64 STRIPPING
T-66 SOIL WASHING

② ALL WASTE CATEGORIES ARE NOT PERMITTED FOR ALL TECHNOLOGIES. CONTACT FACILITY FOR SPECIFICS.

DISPOSAL ③



③ NO ON-SITE DISPOSAL

☆U.S. GOVERNMENT PRINTING OFFICE: 1989/648-163/87103